Stroke: Clinical Pattern, Mortality and Associated Factors in a Referral Hospital, Northwest Ethiopia

Ermias Shenkutie , MD

Resident in Internal medicine, Department of Internal Medicine

School of Medicine, GCMHS, University of Gondar

Email: ermiasshe@yahoo.com

Advisors: Ermias Diro, MD

Associate professor , Department of internal medicine

School of Medicine, GCMHS, University of Gondar

Email: ermi_diro@yahoo.com

Getahun Asres, MD

Associate Professor, Department of internal medicine

School of Medicine, GCMHS, University of Gondar

Email: asresgetahun@yahoo.com

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Acronyms

AIDS:	Acquired Immunodeficiency Syndrome
CT:	Computed Tomography
DALYS:	Disability Adjusted Life Years
DCMP:	Dilated cardiomyopathy
DM:	Diabetes Mellitus
HIV :	Human Immunodeficiency Virus
HHD:	Hypertensive heart disease
ICH:	Intracranial Hemorrhage
IHD:	Ischemic heart disease
MRI:	Magnetic Resonance Imaging
NIHSS:	National Institute of Health Stroke scale
RHD:	Rheumatic heart diseasse
SSA:	Sub-Saharan Africa
UK:	United Kingdom
UoG:	University of Gondar
WHO:	World Health Organization

Abstract

Background: Stroke is one of the commonest causes of morbidity and mortality among non communicable diseases. Its occurrence is significantly increasing in Sub Saharan Africa in the last couple of decades. Mortality has been shown to be higher in this area compared to developed countries. Yet, there is a big information gap about stroke in Ethiopia.

Objectives: The main objective of this study is to describe the clinical pattern, hospital case fatality rate and predictors of mortality in patients admitted with clinical diagnosis of stroke in University of Gondar Hospital.

Methods: Retrospective chart record analysis of adult stroke patients admitted to University of Gondar hospital medical wards from June 2009 to May 2013 was done. Sociodemographics, risk factors, clinical presentation and treatment outcomes were collected using a prepared format. Data entry, cleaning and analysis was performed using Epi-info version 7.0. Descriptive analysis was presented as frequency percentage for categorical variables and as means with SD and median with IQR for continuous variables. Group comparison was done by chisquare for categorical variables and by student t test, ANOVA or Kruskal Walis test for continuous variables. Bivariate and multivariate analyses were done when appropriate. P value < 0.05 was taken as cut off for statistically significant association.

Results: A total of 240 patients with stroke were included in the study with median age of 67.5(IQR: 57.5-75) years and M:F of 1.1:1. Ischemic stroke was the commonest type comprising 70% of the cases. Hypertension(51.5%) and atrial fibrillation(24.9%) were the most prevalent risk factors. Factors strongly associated with ischemic stroke compared to hemorrhagic were age> 65 years, atrial fibrillation, structural heart disease and diabetes while hypertension was associated with hemorrhagic stroke. The in hospital case fatality rate was 18.1% with median duration of hospital stay before death of 4 days. Factors independently associated with mortality were altered consciousness and raised intracranial pressure. There was a high rate of discharge against medical advice(30%).

Conclusion and recommendation: The number of stroke patients admitted in the hospital has increased from the past. Ischemic stroke is the most common type. Appropriate screening and treatment of hypertension and atrial fibrillation should be give due attention as they are the most commonly identified risk factors. Most deaths occurred early after admission due to stroke related acute complications; as such an emergency stroke care unit capable of managing these complications can partially decrease the death rate.

1. Introduction

1.1 Statement of the problem

Stroke or cerebrovascular accident is defined clinically as a focal or global disturbance of cerebral function of sudden onset lasting 24 hours or longer or leading to death with no apparent cause other than that of vascular origin(1). The pathologic subtypes include ischemic and hemorrhagic stroke. Ischemic stroke includes thrombotic and embolic stroke. The later can be cardioembolic or artery to artery embolism. Hemorrhagic subtype consists of intraparenchymal and subarachinoid hemorrhage (2). Stroke is one of the commonest causes of morbidity and mortality all over the world (3). There are recognized modifiable and non modifiable risk factors for stroke. Older age, male sex and family history are non modifiable risk factors. Hypertension, diabetes, cigarette smoking, dyslipidemia, sedentary life style, structural heart disease and arrhythmias are among the modifiable risk factors.

Stroke used to be a common problem in developed countries as compared to third world countries in the past. Recent community surveys undertaken in African countries showed stroke prevalence between 200 and 300 per 100,000(4-6). These figures are lower when compared to reports from developed countries (600-1000 per 100,000)(7). But when compared with earlier studies on stroke in African setting which showed prevalence of 58-68 per 100,000, there is almost a 400% increase(8, 9). In general, SubSaharan Africa can be considered as undergoing epidemiologic transition from one which was dominated by infectious disease previously to one which is dominated by non communicable diseases currently.

Stroke is the second commonest cause of death worldwide with two-thirds of these deaths occurring in developing regions of the world such as sub-Saharan Africa. Among the global deaths from stroke of all age in 2005, 87% occurred in low-income and middle-income countries. In fact, this fraction of global stroke deaths increases when people under 70 years are considered(3). The age-standardized stroke mortality is also significantly higher in SSA countries as compared to developed countries (7). In general, stroke is associated with significant mortality at a relatively younger age in developing countries.

Despite the evidences showing increasing trend of stroke in SSA, good-quality data on the epidemiology, prevention, and management of stroke in SSA are still deficient. The situation in our country is also no different. Reda et. al. found out a low prevalence of stroke(15 per 100,000) in a rural community based study in Ethiopia during 1986-1989(10). Although stroke is currently observed to be one of the commonest reasons of admission in many Ethiopian hospitals, its prevalence in the community is not known as there are recent community based studies. The age adjusted stroke mortality from WHO's report in 2004 is high estimated to be 122 and 153.8 per 100,000 for males and females respectively in Ethiopia(7). There are only few finger counted local hospital based studies on this issue in Ethiopia and none is found in our hospital (11-13). As patients usually present late and the standard of care is poor compared to hospitals in developed countries, the in hospital mortality is expected to be higher. Most of

the information regarding stroke mortality and its determinants that we use in the management of stroke comes from studies in developed countries. So it is imperative that a lot has to be done to address the issues concerning the burden of stroke and its mortality in Ethiopia. This study aimed at determining the clinical pattern, in hospital case fatality and factors associated with mortality in stroke patients admitted to University of Gondar Hospital.

2. Objectives

2.1 General objectives:

To determine the clinical pattern, in hospital mortality and associated factors among patients admitted with clinical diagnosis of stroke in University of Gondar Hospital

2.2 Specific objectives:

1. To determine the clinical types of stroke
2. To identify risk factors associated with specific types of stroke
3. To determine the in hospital case fatality rate of
4. To identify factors associated with in hospital mortality

3. Methodology

3.1 Study setting

University of Gondar Hospital is a teaching hospital found in Gondar town, North West Ethiopia. It serves about 5 million people in its catchment area as a referral hospital. It has a total bed capacity of 400. Most patients come from the rural areas. Different kinds of communicable and non communicable diseases are managed in the hospital both in the inpatient and outpatient departments. The department of internal medicine delivers health service to patients admitted in the medical wards. Basic investigations including full blood count and blood chemistry tests are available. Serum cholesterol and triglyceride are done among the lipid profile tests. CT scan is also available but most patients don't get it because of frequent malfunction and affordability.

The diagnosis of stroke in the hospital is mainly based on clinical presentation and neurologic assessment. A typical patient will present with sudden onset of focal neurologic deficit or loss of consciousness. Additional history will identify the presence of risk factors. Ascertainment of stroke subtype is made by using the clinical scoring methods. When possible patients are sent for CT scans. Patients are admitted to the general medical wards and to the medical ICU upon indications. Patients are usually provided with general supportive care and physiotherapy. Medications usually prescribed for these patients are aspirin, statins, oral antihypertensives, heparin, warfarin, manitol and other common medications depending on indications. The overall management of stroke patients is supervised by a neurologist. Most of the patients getting the service are from rural areas which are far but

infrastructures like transportation and telephone services have significantly improved in the past couple of decades.

3.2 Data collection period

June 2009- May 2013

3.3 Study design:

This is hospital based retrospective chart record analysis

3.4 Study population

All patients of age 18 years and more admitted to University of Gondar Hospital from June 2009 to May 2013 with a diagnosis of stroke were considered for this study. Patients with incomplete records were excluded.

3.5 Variables

Dependant variable:

In hospital Death

Independent variable:

Age, Sex, type of stroke, hypertension, Atrial fibrillation, DM, previous stroke, Admission systolic blood pressure, Admission diastolic blood pressure, admission temperature record, pulse rate, level of consciousness at admission, admission random blood sugar level, aspiration pneumonia, raised intracranial pressure

3.6 Data Collection Method

Admission and discharge log books of respective medical wards and ICUs were screened to select patients with diagnosis of stroke. The medical case records of these patients were retrieved from the record rooms based on their medical record number. Available case records were checked for inclusion and exclusion criteria. Data was manually collected using a structured and pretested data extraction format from the included case records. The data extraction format included sociodemographic characteristics, clinical and laboratory findings and outcome. Data was collected by trained residents and the investigator.

3.7 Data Analysis

Data was checked for completeness and accuracy and was entered to Epiinfo version 7.0 . Data analysis was performed using the same software. Descriptive statistics is presented in means and standard deviation or medians with inter quartile range for numerical variables and frequency percentages for categorical variables. Group comparison was done using chisquare for categorical variables and student t test and ANOVA for continuous variables with normally distributed variance. Kruskal Wallis/Mann Whitney test was used for comparison of group means of variables with skewed distribution. Odds ratios were used as measures of association. Statistical significance was defined by P value less than 0.05 and OR 95% confidence interval which does not include 1. Bivariate and Multivariate logistic regression

models were used to identify factors associated with specific type of stroke and in hospital mortality. Tables and graphs were be used to show results as appropriate.

4. Ethical consideration

This study required secondary data from medical case records and patients were not contacted. We assured that the data from the case records were handled with strong confidentiality. Neither the case records nor the data extracted were used for any other purpose. The research proposal was approved by be the ethical board of school of medicine of University of Gondar. The study was started after ethical clearance was obtained from the board and after permission from the CEO of the hospital to review records.

5. Results

A total of 340 cases with a diagnosis of stroke were identified from the discharge log books of each ward, amongst which 270 case records were retrieved from the record room. Most of the lost case records were for patients who were admitted in 2009 and 2010. We had to exclude 30 cases because of incomplete documentation and investigators concern about the correctness of diagnosis of stroke in some of the cases. Therefore, a total of 240 cases fulfilling the inclusion criteria were finally selected for analysis. Table 1 shows that the annual number of admission for stroke increased progressively over the 4 years data collection period.

5.1 Sociodemographic Characteristics of Study Population

As shown in Table2 males and females comprised 127(52.92%) and 113(47.08%) of the study population respectively giving a male to female ration of 1.12:1. The male to female ratio was 1.15:1 and 1.06:1 for ischemic and hemorrhagic stroke respectively (P=0.76). Even though it was not statistically significant, females accounted for a greater number of cases when patients under the age of 60 years were considered (55.1% versus 44.3%; P=0.12).

The median age of the population was 67.5 years(IQR: 58.5-75). As shown in table1 Patients with ischemic stroke tend to be older than those with hemorrhagic stroke with mean ages of 70 and 60 years respectively(P = 0.0003).Figure 1 depicts that the number of patients with ischemic stroke increased steeply from 40 to 79 years of age. On the other hand, the age distribution of hemorrhagic stroke was bimodal with a lower peak in 30-39yrears and a higher peak in the 60-69 years of age group. Stroke in the young, defined by age less than 45 years, accounted for 22(9.2%) of the total cases. Female patients with any type of stroke were younger than males with median ages of 65 and 70 years respectively (P =0.034). When subgroup analysis was done comparing the mean age of male and female patients in stroke subtypes, female patients with ischemic subtype were still younger with mean age of 68 versus

73 years for males (P =0.028). On the other hand, there was no statistically significant age difference between females and males with hemorrhagic stroke subtype (mean ages 60 and 63 yrs respectively).

Patients from rural area accounted for 123(53.25%) and those from urban areas 108(46.75%). There was no significant difference with regard to area of residence in stroke subtypes.

Table1. Annual admission rate of stroke in UoG Hospital during June 2009-May 2013

Completed year	Number of cases	Total admission	Proportion of stroke(%)
June 2009-May 2010	16	1650	1
June 2010-May 2011	33	1845	1.8
June 2011-May 2012	72	2125	3.4
June 2012-may 2013	119	2261	5.2

Table2. Sociodemographic characteristics of patients with stroke subtypes admitted to UoG Hospital between June 2009 and May 2013

Variables		Total(n=240) No(%)	Ischemic(n=168) No(%)	Hemorrhagic(72) No(%)	P value
Sex	F	113(47.08)	78(46.4)	35(48.6)	0.756
	M	127(52.92)	90(53.6)	37(51.4)	
Age(yrs)	18-39	14(5.83)	4(2.38)	10(13.89)	0.0003
	40-64	81(33.75)	52(30.95)	29(40.28)	
	>65	145(60.42)	112(66.67)	33(45.83)	
Area of residence	Urban	108(46.75)	79(49.1)	29(41.4)	0.285
	rural	123(53.25)	82(50.9)	41(58.6)	

5.2 Stroke subtypes

The most common stroke subtype was Ischemic diagnosed, either clinically at discharge or confirmed by CT scan, in 168(70%) of the cases while hemorrhagic stroke accounted for the remaining 72(30%) cases. Included among the hemorrhagic strokes is one case of subarachinoid hemorrhage. CT scan reports were available for 98(40.8%) patients. The most common CT scan diagnosed stroke was still ischemic stroke accounting for 29(69.4%)

Table3. Proportion of stroke subtypes by method of diagnosis among patients admitted in UoG Hospital between 2009 and 2013

Method of diagnosis	Ischemic N(%)	Hemorrhagic N(%)
CT scan diagnosed(98)	68(69.4)	30(30.6)
Clinical diagnosis alone(142)	100(70.4)	42(29.6)
Total cases(240)	168(70)	72(30)

5.3 Risk Factors

As shown in Table 3 hypertension was the most common risk factor identified in more than half of the cases followed by structural heart disease and atrial fibrillation. Hypertension was the most prevalent risk factor in both stroke subtypes albeit it occurred more in patients with hemorrhagic stroke. Table 4 shows that among the structural heart diseases degenerative valve disease and hypertensive heart disease were the most common. Rheumatic heart disease was found in only two patients. Patients with ischemic stroke tend to have a higher proportion of any form structural heart disease(44%) compared to hemorrhagic stroke patients(26.4%)(OR=2.2 ; CI: 1.2-4.03).

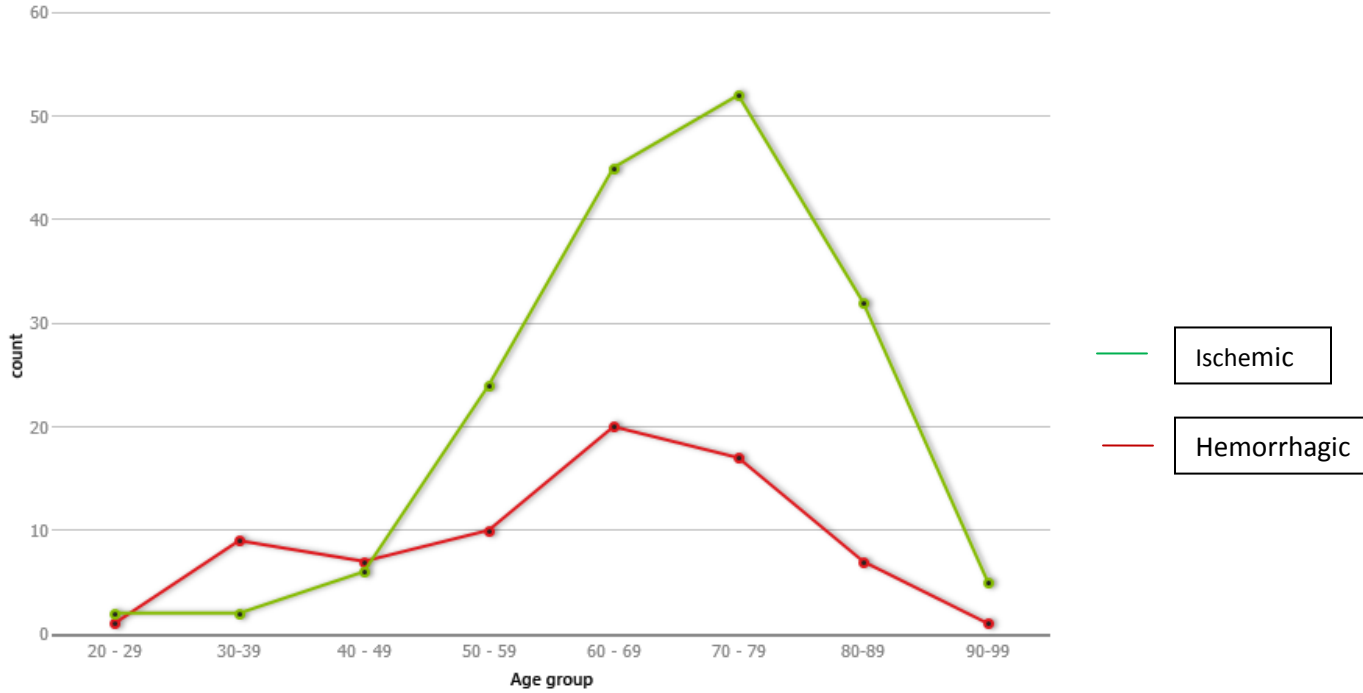

Figure1. Distribution of stroke subtypes by age in patients admitted to U.O.G Hospital between June 2009 and May 2013

Almost a quarter of all patients (24.9%) and a third (31.7%) of patients with ischemic stroke had atrial fibrillation. The prevalence of atrial fibrillation increased with increasing age, presence of structural heart disease and recurrent stroke. Compared to patients younger than 60 yrs, patients older than 60 years had higher proportion of atrial fibrillation (30.1 vs 8.8%, OR=4.48; CI: 1.69-11.85).). Among patients with structural heart disease it occurred in 34.1% compared to 19% in those without heart disease (OR=2.2; CI: 1.2-4.02). Among the 14 patients with recurrent stroke, 7(50%) had atrial fibrillation.

Table4. Risk factors in patients with stroke subtypes admitted to UoG Hospital between June 2009 and May 2013

		Total No(%)	Ischemic No(%)	Hemorrhagic No(%)	OR	95% CI	P value
Hypertension (n=235)	Yes	121(51.5)	73(44.8)	48(66.7)	0.41	0.23-0.72	0.002
	no	114(48.5)	90(55.2)	24(33.3)			
Structural heart disease(n=240)	Yes	93(38.8)	74(44)	19(26.4)	2.2	1.2-4.03	0.010
	No	147(61.2)	94(56)	53(83.6)			
Atrial fibrillation (n=232)	yes	58(24.9)	52(31.7)	6(8.7)	4.88	1.98-11.98	0.0002
	no	175(75.1)	112(68.3)	63(91.3)			
DM (n=230)	yes	23(10)	20(12.3)	3(4.4)	3.05	0.88-10.64	0.091
	No	207(90)	142(87.7)	65(95.6)			
Previous stroke(n=240)	yes	14(5.9)	13(7.8)	1(1.4)	5.99	0.86-258.23	0.07
	no	226(94.1)	155(92.2)	71(98.6)			
Total cholesterol (n=161)	> 200mg/dl	12(7.5)	9(7.4)	3(7.5)	0.99	0.25-3.85	1.0
	<200mg/dl	149(92.5)	112(92.6)	37(92.5)			

Atrial fibrillation not associated with hypertension or any form of heart disease was identified in 16(6.67%) of patients. None of these patients were taking anticoagulants at the time of admission.

Table 5. Type of structural heart disease in patients with different stroke sub types

Type of structural heart disease	Total(240) N(%)	Ischemic(168) N(%)	Hemorrhagic(72) N(%)	P value
RHD	2(0.8)	2(1.2)	0(0)	
IHD	17(7.1)	14(8.3)	3(4.2)	0.409
HHD	29(12.1)	19(11.3)	10(13.9)	0.57
DVHD	48(20)	41(24.4)	7(9.7)	0.009
DCMP	8(3.3)	8(4.8)	0(0)	0.110

Diabetes was identified in 23(10%) patients. Seventeen patients (7.39%) had both diabetes and hypertension. Among 161 patients for whom total cholesterol was measured only 12(7.45%) had levels greater than 200mg/dl. Fourteen (5.9%) patients had previous stroke. Thirteen of them had a current ischemic stroke. Three females developed stroke during peripartum. One had RHD, while 2 had no identified risk factor. Only one patient with ischemic stroke had history of smoking. Among 172 patients with known HIV status, one was positive.

Factors associated with specific type of stroke

On bivariate analysis factors that were more associated with one type of stroke with P value less than 0.2 were hypertension, age>65yrs, atrial fibrillation, any kind of structural heart disease, diabetes and previous stroke. These factors were fitted in to a multivariate logistic analysis model whose output is shown in table 5. In our study patients with a diagnosis of stroke, factors which are more significantly associated with ischemic rather than hemorrhagic stroke are age > 65yrs, atrial fibrillation, structural heart disease and diabetes. On the other hand hypertension was more associated with hemorrhagic stroke.

Table6. Multiple logistic regression model of risk factors associated with stroke subtypes in patients admitted with stroke to UoG Hospital between June 2009 and May 2013

Variable		Ischemic N(column%)	Hemorrhagic N(column%)	Crude OR	CI	Adjusted OR	CI
Age	≥65	108(79.8)	32(62.5)	2.25	1.26-4.00	2.02	1.05-3.87
	<65	54(20.2)	36(37.5)				
Structural Heart disease	yes	74(44)	19(26.4)	2.2	1.2-4.03	2.57	1.26-5.23
	No	94(56)	53(73.6)				
Atrial fibrillation	Yes	52(31.7)	6(8.7)	4.88	1.98-11.98	3.03	1.16-7.92
	No	112(68.3)	63(91.3)				
Hypertension	yes	73(44.8)	48(66.7)	0.41	0.23-0.72	0.33	0.17-0.65
	No	90(55.2)	24(33.3)				
DM	yes	20(12.3)	3(4.4)	3.05	0.88-10.64	5.03	1.3-19.39
	no	142(87.7)	65(95.6)				
Previous stroke	yes	13(7.8)	1(1.4)	5.99	0.86-258.23	3.89	0.42-36.30
	no	155(92.2)	71(98.6)				

5.4 Neurologic deficits

Table 3 shows the frequency distribution of different neurologic deficits identified in our study patients. Hemiparesis/hemipegia and cranial nerve deficits were the most common neurologic deficits. Hemiparesis/hemiplegia was relatively more common in patients with ischemic stroke than hemorrhagic stroke. Among the aphasias Broca's type was the most common. Overall, alteration of consciousness was present in 83(34.58%) patients and it was more common in those with hemorrhagic stroke. Urinary incontinence was present in 25(10.42%) patients. Seizure occurred in 25(10.42%) patients. Generalized seizure was relatively more common than focal seizure, and it occurred more commonly in patients with hemorrhagic stroke .

5.5 Complications and concomitant conditions

Table 4 outlines complications and concomitant conditions. Aspiration pneumonia (24.17%) and increased intracranial pressure (20%) were the two leading complications. Both were more common in hemorrhagic stroke. Other hospital acquired infection occurred in 10(4.2%) patients.

Table7. Neurologic deficits and signs in patients with stroke subtypes admitted to UoG Hospital between 2009 and 2013

	Total(n=240)		Ischemic(n=168)		Hemorrhagic(n=72)		OR	CI
	No	%	No	%	No	%		
Hemiparesis	218	90.8	161	95.8	57	79.16	6.05	2.35-15.6
CN palsy	150	62.5	110	65.48	40	55.6	1.52	0.86-2.67
Alteration of consciousness	83	34.58	36	21.43	47	65.28	0.15	0.08-0.27
Broca's Aphasia	50	20.8	45	26.79	5	6.94	4.9	1.86-12.94
Urinary incontinence	25	10.42	8	4.76	17	23.76	0.16	0.07-0.4
Generalized seizures	16	6.67	7	4.17	9	12.5	0.3	0.1-0.85
Focal seizures	9	3.75	7	4.17	2	2.78	1.5	0.3-7.5
Global aphasia	9	3.75	6	3.57	3	4.17	0.85	0.18-5.41
Wernicke's aphasia	1	0.42	1	0.6	0	0		
other	3	1.25	3	1.79	0	0		

Eight patients(3.3%), all of them with ischemic stroke, had clinical heart failure during their admission. Other less common complications were DVT/PE, bedsores and DKA in 2, 3 and 1 patients respectively.

Carotid Doppler ultrasound studies were done for a total of 46 patients. It was normal in 14(30.43%), showed atherosclerosis without stenosis in 17(36.96%) and atherosclerosis with stenosis in 15(32.61%) patients. Anemia(hemoglobin <12g/dl) and thrombocytopenia(<150000/ul) were found in 18.23% and 19.19% of patients with available results. Hyperglycemia (random blood sugar >180mg/dl) and deranged renal function (creatinine>1.2mg/dl) occurred in 11.22% and 16.1%. All the above variables were not significantly different in the stroke subtypes.

Table8. Complications and concomitant conditions in patients with stroke subtype admitted UoG Hospital between June 2009 and May 2013

variable		Total N(%)	Ischemic N(%)	Hemorrhagic N(%)	OR	95%CI	P value
Aspiration pneumonia(n=240)	yes	58(24.2)	33(19.6)	25(34.7)	0.46	0.25-0.85	0.012
	No	182(75.8)	135(80.4)	47(65.3)			
Increased ICP(n=240)	Yes	48(20)	16(9.5)	32(44.4)	0.13	0.07-0.26	<0.001
	No	192(80)	152(90.5)				
Carotid atherosclerosis(n=46)	Yes	32(69.6)	27(69.2)	5(71.4)	0.9	0.08-6.54	1
	No	14(30.4)	12(30.8)	7(28.6)			
Anemia(n=203)	Yes	37(18.2)	28(19.2)	9(15.8)	1.27	0.56-2.89	0.574
	No	166(81.8)	118(80.8)	48(84.1)			
Thrombocytopenia (n=198)	Yes	38(19.2)	25(17.7)	13(22.8)	0.73	0.34-1.55	0.411
	No	160(80.2)	116(82.3)	44(77.2)			
Hyperglycemia (n=205)	Yes	23(11.2)	15(10.6)	8(12.5)	0.83	0.33-2.08	0.696
	No	182(88.8)	126(89.4)	56(87.5)			

5.6 Outcome

The in hospital case fatality of stroke was 18.14%. Fgure3 shows that among the 237 patients with documented outcomes, 110(46.41%) were discharged with improvement where as 42(18.14%) died in the hospital. Twelve (5.06%) patients were discharged with the same condition and one was referred. seventy one (29.96%) patients were discharged against medical advice on self and family request. The median duration of hospital stay was 9(IQR: 3 -16) days and ranged from 1 to 110 days. The median duration of hospital stay before death was 4days. Death on the first day of admission accounted for 28.57% of the deaths while 61.9% of the deaths occurred in the first five days.

Causes of Death

The commonest causes of death in descending order are increased ICP(20(47.62)), Aspiration pneumonia(11(26.9%)), the primary stroke(5(11.9%)), pulmonary embolism(2(4.76%)), other hospital acquired sepsis (1(2.38%)) and no specific cause apart from the stroke was identified in 7(16.3%) patients.

5.7 Factors associated with mortality

With bivariate analysis factors significantly associated with mortality were: Age≥ 65yrs, hemorrhagic subtype, alteration of consciousness, increased ICP, aspiration pneumonia, pulse rate≥100bpm, temperature≥37.5°C and generalized seizure . The above variables were fitted in a multiple logistic regression model. Even though they were not significant at P<0.05, previous stroke and diastolic BP were included in the regression model. Previous stroke was significant for mortality at P< 0.2 and diastolic blood pressure significantly confounded increased ICP, alteration of consciousness and aspiration pneumonia. Table 3 shows the bivariate and multivariate analysis results. Factors with

positive independent association with mortality were alteration of consciousness and increased ICP while diastolic BP≥100mmhg had an independent negative association.

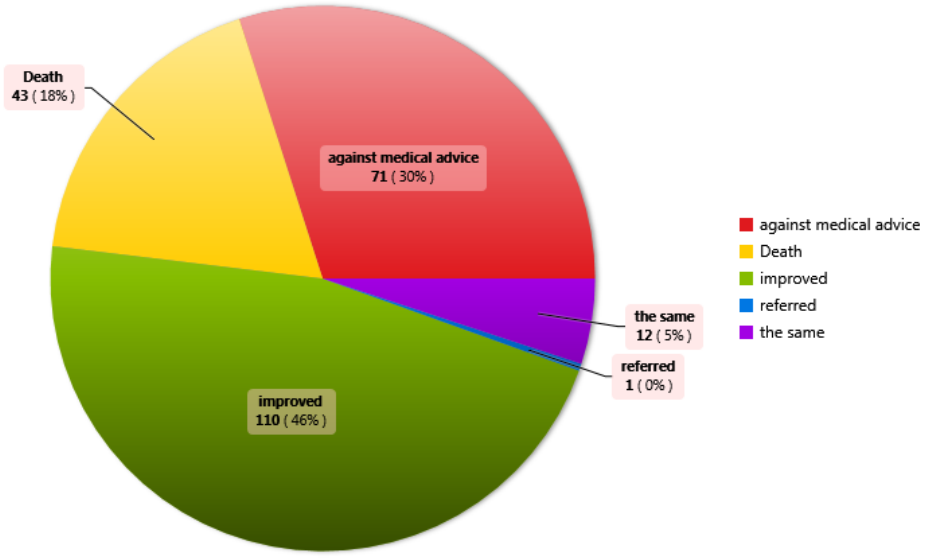

Figure2. Outcome of patients admitted with stroke in U.O.G. Hospital between 2009 and 2013

Table9. Multiple Logistic regression of factors associated with mortality in patients admitted with stroke in UoG Hospital between June 2009 and May 2013

variables		Mortality N(% row)		Crude OR	CI	Adjusted OR	CI
		Yes	No				
Age	>=65yrs	33(22.9)	111(77.1)	2.47	1.15-5.23	2.31	0.84-6.34
	<65yrs	10(10.8)	83(89.2)				
Type of stroke	Hemorrhagic	19(26.8)	52(73.2)	2.16	1.1-4.27	1.23	0.41-3.66
	ischemic	24(14.5)	142(85.5)				
Alteration of consciousness	Yes	29(34.9)	54(65.10	5.37	2.64-10.93	2.66	1.03-6.88
	no	14(9.1)	140(90.9)				
Aspiration pneumonia	Yes	25(43.1)	33(56.9)	6.78	3.32-13.81	2.40	0.88-6.56
	no	18(10.1)	161(89.9)				
Increased ICP	Yes	26(55.3)	21(44.7)	12.6	5.89-26.96	8.15	2.53-26.26
	no	17(8.9)	173(91.1)				
Pulse rate	>=100	13(34.2)	25(65.8)	2.83	1.3-6.13	2.74	0.95-7.89
	<100	30(15.5)	163(84.5)				
temperature	>=37.5	9(37.5)	15(62.5)	3.05	1.24-7.54	1.07	0.31-3.67
	<37.5	16.4(34)	173(83.6)				
Diastolic BP	>100mmhg	13(17.3)	62(82.7)	0.92	0.45-1.88	0.31	0.11-0.88
	<100mmhg	29(18.6)	127(81.4)				

Previous stroke	Yes	5(35.7)	9(64.3)	2.69	0.85-8.48	1.44	0.37-6.17
	No	38(17.1)	184(82.9)				
Generalized seizure	Yes	6(36.5)	10(62.5)	2.98	1.02-8.72	3.02	0.70-13.02
	No	37(16.7)	184(83.3)				

6.Discussion

This is the first study on stroke in U.O.G Hospital showing the clinical pattern and outcome. The admission rate of stroke increased progressively over the 4 years period. The exaggerated difference may be due to disproportionate loss of records from the earlier years. Nonetheless, The number of stroke patients admitted in the completed year from June 2012 to May 2013, for example ,was 119 which is more than triple of the 34 cases identified between October 1994 and September 1995 in our hospital in a previous admission analysis (14). This is consistent with the increasing trend of stroke reported in different African countries as part of the epidemiologic transition (15, 16).

In our study ischemic stroke was the commonest subtype accounting for 70% of cases. This proportion was almost similar when the diagnosis was either clinical alone or confirmed by CT scan. There is a great variation in this proportion in different SSA studies which utilized CT scan with reported rates for hemorrhagic stroke ranging from 15-60%(17-20). Despite this difference, hemorrhagic stroke appears to be more common in SSA countries compared to the developed world. This difference may be the result of difference in study designs, hospital admission bias or difference in the population pyramid, socioeconomic and risk factor profiles between the two populations.

Consistent with other reports from studies in SSA, males accounted for a slightly higher number of cases in our study with a male to female ratio of 1.12:1(13, 18, 20, 21). The ratio was not statistically different in both types of stroke. Admission bias due to cultural and financial male predominance might have affected the ratio. Even though male sex is described as a risk factor for cardiovascular disease in general, it appears that female patients are almost equally affected.

The age distribution observed in our study(67.5 years) was higher than results from similar hospital based studies in other SSA countries showing median ages less than 60 years (13, 20-22). It was rather consistent with reports from developed countries. However, age distribution of the female patients(65 years) was low than developed countries(67-78 years) (1, 23). And this difference is more pronounced in ischemic stroke. While the hospital admission bias is still there, this difference may be explained by the higher occurrence of sex specific risk factors like pregnancy and rheumatic mitral valve disease and less access to diagnosis and treatment of hypertension in females in our setup. Weather women in our community are predisposed for premature atherosclerosis requires further study. This study has shown that patients with hemorrhagic stroke were younger(60 years) than those with ischemic stroke(70 years). This seems to be the effect of higher prevalence of hypertension in this group and reflects the earlier onset of end organ damage due to undertreated hypertension.

6.1 Risk factors

Our study, similar to other studies elsewhere, has shown that hypertension, found in more than half, is by far the most commonly identified risk factor. Even though we haven't assessed the treatment history, our experience and other studies from SSA tells us that most patients with hypertension are either previously undiagnosed, or not appropriately treated (13, 18, 20, 22). Diabetes was identified in 10% of our patients which is lower than studies elsewhere. and it was often present together with hypertension. (18, 20). It was often present together with hypertension which entails their synergistic effect on stroke. Therefore, the beneficial effect of screening and treatment of hypertension and diabetes for the prevention of stroke cannot be overemphasized.

Atrial fibrillation was identified in 24.9% of all cases and 31.7% of ischemic stroke cases in our study which is higher than reports from elsewhere (15-23%) (25-27). As the diagnosis was based on a single ECG, the prevalence could be underestimated. Despite the fact that anticoagulants are effective for preventing stroke from atrial fibrillation, none of the patients were taking anticoagulants. Rheumatic heart disease, which was reported to be a common risk factor for stroke especially in the young in other Ethiopian studies, was found to be less common in our study.

Tobacco smoking, as shown in other Ethiopian studies was very rare in our patients while it was common in other countries(13.4%-26.8%)(24)(23, 28, 29). Although, fasting lipid profiles were not available in our cases, none of the patients had previous diagnosis of dyslipidemia and high cholesterol was measured in 7.5%. While dyslipidemia is a common strong risk factor in affluent societies, studies in developing countries have found mixed results; some showing relatively higher percentage (14% in Zambia, 26% in India) others reporting low figures (3% in Nigeria)(23, 28, 29). Therefore, these major risk factors that have been implicated for the increasing trend in stroke incidence in developing countries don't appear to play a major role in our setup. Though it is a trending fact that the transformation to western diet and habits will increase the rate of cardiovascular disease in our community in the future, at this point these risk factors don't seem to be responsible for the increase in stroke cases.

HIV was associated with stroke in some studies but its prevalence in our patients was low(30, 31). Low prevalence of HIV in stroke patients was also reported from other studies in Ethiopia and Kenya(18, 24).

We have found that patients with hemorrhagic stroke tend to present with more non focal than focal symptoms like altered consciousness and urinary incontinence compared with ischemic stroke. Two of the grave complications associated with altered consciousness, increased intracranial pressure and aspiration pneumonia, were also far more common in patients with hemorrhagic stroke.

6.2 Outcome

The in hospital case fatality rate of stroke in our study was 18.14% with deaths on the first day and within 5 days of admission accounting for 28.57% and 61.9% of the total deaths. This figure, while higher than reports from western studies, is quite lower compared to similar SSA studies reporting rates

between 21%-44.5%(13, 20, 28, 29). This difference at least partly is explained by the high rate of discharge against medical advice (30%) in our patients. As it is our experience that patient attendants make this decision when patient's condition is deteriorating or is not changing, we believe that the mortality rate is higher than what is reported here. Thus, the in hospital mortality rate may not reflect the true short term mortality. A prospective follow up study with confirmation is necessary to get the true short term mortality.

Different interrelated factors like alteration of consciousness, aspiration pneumonia, increased intracranial pressure, hemorrhagic subtype, fever and tachycardia were associated with increased mortality on bivariate analysis. But these factors were very much interrelated that only increased intracranial pressure and altered mental status were independently associated with mortality. Generally, these complications developed early in the course of stroke especially in those with hemorrhagic stroke and predisposed patients to complications like aspiration pneumonia. Prevention, early identification and management of these factors would at least have salvaged some of the patients. Therefore, the increased early mortality in our patients is partly due to the absence of an emergency stroke care setup capable of early identification and management of these acute complications.

7.Conclusion

The number of patients admitted with diagnosis of stroke in our hospital has increased significantly in the past years. Ischemic stroke is the most common type. Hypertension(51.5%) and atrial fibrillation(24.9%) were the most prevalent risk factors identified. The in hospital case fatality rate (18.14%) is lower than other SSA hospital studies but significant proportion of patients were discharged against medical advice(30%). Increased intracranial pressure and alteration of consciousness were independently associated with mortality. Most deaths occurred in the first five days of admission.

8.Recommendations

A prospective hospital based study and community based stroke incidence and prevalence studies are required to define the true sociodemographic characteristics of stroke and the associated factors in our population.

Strategies for screening and management of hypertension and atrial fibrillation should be given priority as these are the most prevalent risk factors identified.

An emergency care set up, perhaps protocol based, capable of identifying and managing early stroke complications is invaluable for the prevention of early stroke related mortality.

9.Limitations of the study

This is a hospital based study and as such the results cannot be generalized to the general population. As this study is based on retrospective chart review, the data obtained was not complete. The performance of brain imaging for the diagnosis was limited and we had to use the final clinical diagnosis of the treating team which is not always accurate. Significant number of patients were discharged against medical advice which made the in hospital mortality non representative of the short term mortality. The study hasn't assessed the rate of disability and functional limitation.

10. References

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